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मीटरी विभाजन माप — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

METRIC DISPENSING MEASURES — SPECIFICATION

(First Revision)

UDC 389·151 : 615·49 : 531·732 (083·75) (54)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1993 Price Group 4

Commercial Weights and Measures Sectional Committee, LM 06

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Commercial Weights and Measures Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

The move for introduction of metric system in the country originated as early as 1867 and an Act of Government of India was passed in 1871. The Act, however, remained inoperative. The question again assumed national importance immediately after independence. In 1948, the ISI set up a Special Committee for the purpose of recommending to Government a uniform system of weights and measures to be adopted throughout the country. Following the recommendation of that Special Committee, the Government of India decided to replace the existing weights and measures in use in different parts of the country by metric weights and measures, within a period of ten years. Necessary legislation for this purpose (*Standards of Weights and Measures Act*, 1956 — Act No. 89 of 1956) was passed and steps were taken to effect the changeover.

This standard was first published in 1957. The revision is based on further experience gained in the manufacture of dispensing measures and other developments in this field as also the revised standards of *Weights and Measures Act*, 1976.

The principal differences between IS 1160 : 1957 and this edition are:

a) The introduction of a 500 ml conical measure

b) The changes in the limits of errors for both the conical and beaker measures

c) The introduction of a method of measuring capacity

d) Changes in the numbering and graduations on the conical and beaker measures

e) The introduction of a requirement for the minimum diameter of the foot and the overall height of the beaker measures

In preparing this standard, assistance has been derived from BS 1922 : 1987 'Dispensing measures for pharmaceutical purposes'.

AMENDMENT NO. 1 JULY 2004
TO
IS 1160 : 1993 METRIC DISPENSING MEASURES — SPECIFICATION

(First Revision)

(*Page* 5, *Table* 2, *col* 2 *and* 3) — Substitute 'm l' *for* 'm' and 'm j'.

(*Page* 5, *Table* 3, *col* 3) — Substitute '**Minimum Length for Unnumbered Lines**' *for* '**Minimum Length of Numbered Lines**'.

(BP 26)

Reprography Unit, BIS, New Delhi, India

Indian Standard

METRIC DISPENSING MEASURES — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies requirements for metric dispensing measures made of glass or transparent plastics materials.

2 DEFINITIONS

For the purpose of this standard the following definitions shall apply.

2.1 Standard Reference Temperature

The temperature at which the measure is intended to contain its nominal capacity (nominal volume).

2.2 Reference Temperature

The standard reference temperature shall be 27°C ± 2°C.

2.3 Capacity

The volume, expressed in millilitres, of water, at the standard reference temperature, contained by the measure at any graduation line when the meniscus at that graduation line is viewed against the centre of an evenly illuminated white background at least 600 mm square and not more than 200 mm from the measure, which stands on a level non-reflecting surface, when the observer's eye is level with the graduation line and when the lowest point of the meniscus as thus seen appears to touch the top edge of that line.

3 TYPES AND DENOMINATIONS

3.1 Dispensing measures shall be of the following types and denominations:

a) *Conical Measures* — 500 ml, 250 ml, 100 ml, 50 ml, 25 ml, 10 ml and 5 ml.

b) *Beaker Measures* — 1 000 ml and 500 ml.

4 CONSTRUCTION

4.1 Material

4.1.1 *Glass Measures*

The measures shall be manufactured from colourless soda-lime-silica or borosilicate glass. The glass measure shall be well annealed; free from stones, cracks and chippings and as free as possible from blisters and other defects. Lead glass shall not be used for the measures.

4.1.2 The glass measures shall comply with the alkalinity test prescribed in Annex A.

4.2 Transparent Plastic Measures

The measures shall be made of a clear and transparent plastic material manufactured from plasticized polyvinyl chloride or copolymer, the major constituent of which is polyvinyl chloride. The plastic material used shall not contain any constituents known to be injurious to health and likely to be extracted by contact with liquids.

4.3 Pouring Lip

4.3.1 Each measure shall be provided with a pouring lip. The form of the lip shall be such that, when the measure is first filled with water to the highest graduation line, the stream poured from the lip falls clear of the outside of the measure.

4.4 Base

4.4.1 Each measure shall be provided with a base on which it shall stand vertically without rocking when placed on a horizontal surface. The size of the base shall be such that the measure, when empty, shall stand without toppling on a plane inclined at 15° to the horizontal.

4.5 Shape of Bottom

4.5.1 The bottom of the measuring space shall be rounded and merge smoothly into the sides of the measure.

4.6 Position of Scales

4.6.1 The scale shall be vertical with the pouring lip of the measure facing to the right.

4.7 Markings

4.7.1 Each measure shall be permanently and legibly marked with the following:

a) The symbol 'ml' and

b) The manufacturer's or vendor's name or trade mark.

5 CONICAL MEASURES

5.1 Denominations — shall be as given in **3.1** (a).

5.2 Dimensions

5.2.1 *Overall Volume*

The overall volume shall be such that, the measure first being filled with water to the highest graduation line, water shall not overflow from the pouring lip when a quantity of water, equal in volume to one-half of the nominal capacity of the measure, is added. The addition of further quantity of water, equal in volume to one-quarter of the nominal capacity of the measure, shall result in water overflowing from the pouring lip.

5.3 Cone Angle

The external surface of the measure shall be a cone having an included angle as follows:

a) for the 5 ml, 10 ml, 25 ml and 50 ml (tall) measures, not less than 10°30′ and not more than 11°30′ (*see* Fig. 1 to 4);

b) for the 50 ml, (squat) and 100 ml measures, not less than 12°30′ and not more than 13°30′ (*see* Fig. 5 and 6);

c) for the 250 ml measure, not less than 18° and not more than 19° (*see* Fig. 7); and

d) for the 500 ml measure, not less than 18° and not more than 20° (*see* Fig. 8).

5.4 Wall Thickness

The wall thickness of the measures shall be as follows:

a) for the 5 ml, 10 ml and 25 ml measures, not less than 1·00 mm;

b) for the 50 ml and 100 ml measures, not less than 1·25 mm; and

c) for the 250 ml and 500 ml measures, not less than 1·50 mm.

5.4.1 The measures should be of sufficiently sturdy construction and should not show any local departures from uniformity.

5.5 Graduation

5.5.1 *Graduation Lines*

The graduation lines shall be clean permanent lines of a uniform thickness not exceeding 0·3 mm, except that they are permitted to taper slightly towards the ends.

The graduation lines shall be in planes perpendicular to the axis of the measure and shall be horizontal when the measure is standing on a horizontal surfae.

5.5.2 *Numbering of Graduation Lines*

The graduation lines shall be numbered in accordance with Table 1 (*see* Fig. 1 to 8). Each number shall be permanently and legibly marked close to the end of the graduation line to which it relates, and shall be in such a position that it would be bisected by a prolongation of the graduation line.

5.5.3 *Length of Graduation Lines*

The minimum length of the graduation lines on a measure shall be in accordance with Table 3. The unnumbered graduation lines shall be

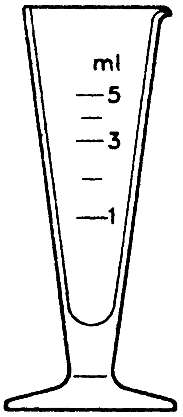

FIG. 1 EXAMPLE OF A 5 ml CONICAL MEASURES

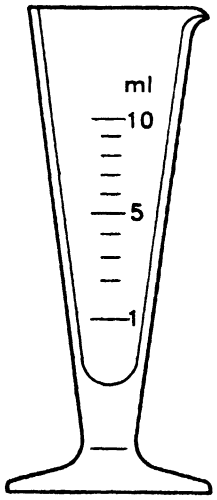

FIG. 2 EXAMPLE OF A 10 ml CONICAL MEASURES

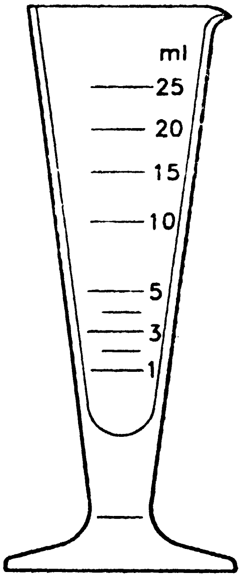

FIG. 3 EXAMPLE OF A 25 ml CONICAL MEASURES

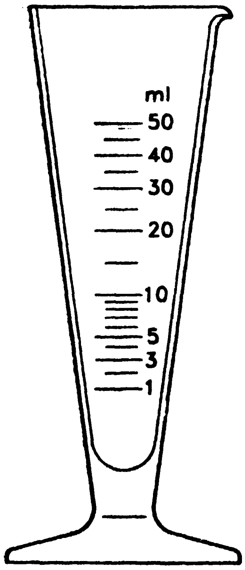

Fig. 4 Example of a 50 ml (Tall) Conical Measure

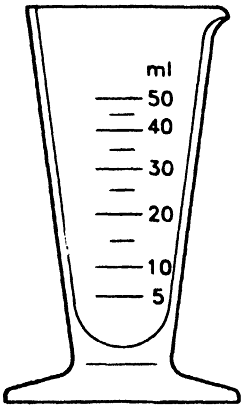

Fig. 5 Example of a 50 ml (Squat) Conical Measure

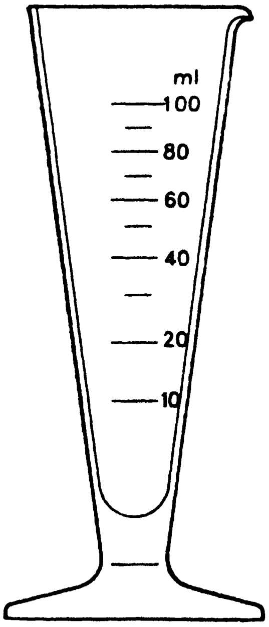

Fig. 6 Example of a 100 ml Conical Measure

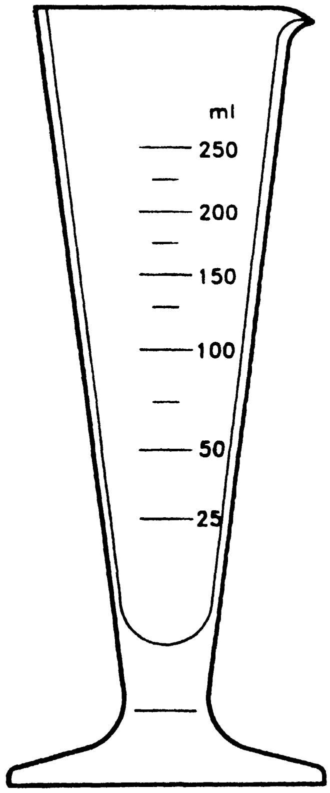

Fig. 7 Example of a 250 ml Conical Measure

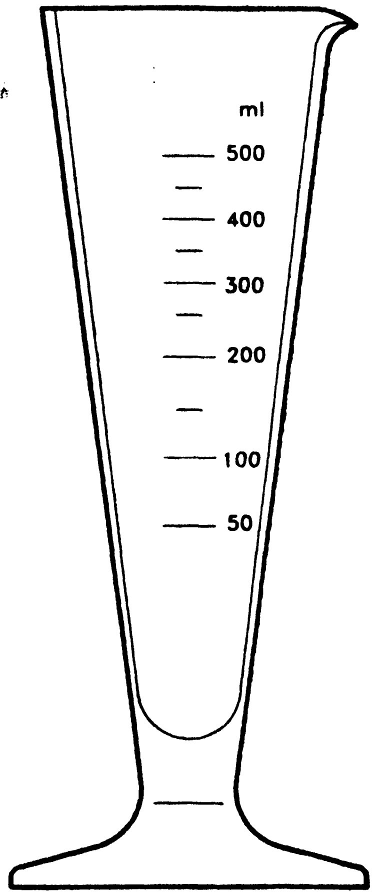

Fig. 8 Example of a 500 ml Conical Measure

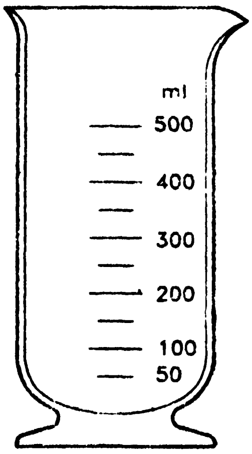

Fig. 9 Example of a 500 ml Beaker Measure

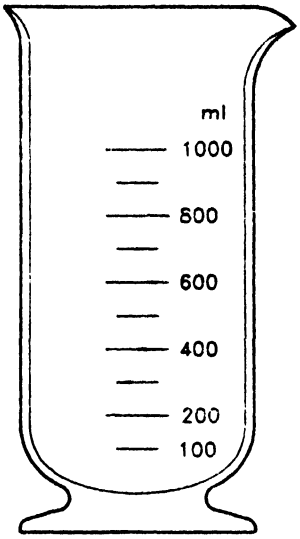

Fig. 10 Example of a 1 000 ml Beaker Measure

shorter than the numbered lines and centrally disposed in relation to them.

5.5.4 *Position of Lowest Graduation Line*

The height of the lowest graduation line above the lowest point in the bottom of the measuring space shall be in accordance with Table 1.

5.5.5 *Levelling Line*

A levelling line shall be permanently and legibly marked on the opposite side of the measure to, and at the same level as, the top graduation line. It shall not be numbered but shall be similar in all other respects to the top graduation line: the same limits of error of capacity shall apply (*see* Table 2).

5.5.6 *Permissible Errors in Capacity*

The permissible errors in capacity shall not exceed the values given in Table 2.

6 BEAKER MEASURES

6.1 Denominations — shall be as given in **3.1**(b).

6.2 Dimensions

6.2.1 *Overall Volume*

The overall volume of the measure shall be such that when the measure is filled with water to the highest graduation mark and a volume of water equal to quarter the denomination volume is added to it, the water shall not overflow.

Table 1 Graduation and Numbering of Conical Measures

(*Clause* 5.5.4)

Nominal Capacity	Graduated at	Numbered at	Height of Lowest Graduation Line Above Bottom of Measuring Space
ml	ml	ml	mm
5	1, 2, 3, 4 and 5	1, 3 and 5	15 ± 5
10	1. 2, 3, 4, 5, 6, 7, 8, 9 and 10	1, 5 and 10	15 ± 5
25	1, 2, 3, 4, 5, 10, 15, and 25	1, 3, 5, 10, 15, 20 and 25	15 ± 5
50 (tall)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, and 50	1, 3, 5, 10, 20, 30, 40, and 50	15 ± 5
50 (squat)	5, 10, 15, 20, 25, 30, 35, 40, 45, and 50	5, 10, 20, 30, 40, and 50	17 ± 5
100	10, 20, 30, 40, 50, 60, 70, 80, 90 and 100	10, 20, 40, 60, 80 and 100	25 ± 5
250	25, 50, 75, 100 125, 150, 175, 200, 225 and 250	25, 50, 100, 150, 200 and 250	40 ± 5
500	50, 100, 150, 200, 250, 300, 350, 400, 450 and 500	50, 100, 200, 300, 400 and 500	50 ± 5

Table 2 Limits of Error of Capacity for Conical Measures

(*Clauses* 5.5.5 *and* 5.5.6)

Capacity Corresponding to Graduation Line	Limits of E rror of			
	5 ml, 10 ml, 25 ml and 50 ml (Tall) Measures	50 ml (Squat) and 100 ml	250 ml Measures	500 ml Measures
ml	m	m)	ml	ml
1	± 0·06			
2	± 0·08			
3	± 0·10			
4	± 0·15			
5, 6	± 0·15	± 0·25		
7, 8	± 0·15			
9, 10	± 0·20	± 0·30		
15, 20, 25	± 0·30	± 0.35	± 0·4	
30, 35, 40	± 0·45	± 0·4		
45, 50	± 0·4	± 0·5	± 0·5	± 0·6
60		± 0·5		
70, 75, 80, 90		± 0·6	± 0·6	
100, 125		± 0·6	± 0·7	± 0·8
150, 175			± 1·0	± 1·0
200, 225, 250			1·5	± 1·5
300, 350				± 2·0
400, 450, 500				± 2·5

Table 3 Minimum Length of Graduation Lines on Conical Measures

(*Clause* 5.5.3)

Nominal Capacity of Measure	Minimum Length of Numbered Lines	Minimum Length of Numbered Lines
ml	mm	mm
5	10	6
10	10	6
25	10	6
50 (tall)	15	10
50 (squat)	15	10
100	17	10
250	20	12
500	20	12

6.2.2 *Diameters and Height*

The beakers shall comply with the dimensional requirements given in Table 4. The shape of the beaker measures is shown in Fig. 9 and 10.

6.2.3 *Wall Thickness*

The wall thickness shall be not less than 1·5 mm. The measures should be of sufficiently sturdy construction and should not show any local departures from uniformity.

6.3 Graduation

6.3.1 *Graduation Lines*

The graduation lines shall be clean permanent lines of a uniform thickness not exceeding 0·3 mm, except that they are permitted to taper slightly towards the ends (*see* Fig. 9 and 10).

The graduation lines shall lie in planes perpendicular to the axis of the measure and shall be horizontal when the measure is standing on a horizontal surface.

NOTE — The graduation lines should be without evident irregularities in their spacing.

6.3.2 *Numbering of Graduation Lines*

The graduation lines shall be numbered in accordance with Table 4 (*see* Fig. 9 and 10). Each number shall be permanently and legibly marked close to the end of the graduation line to which it relates, and shall be in such a position that it would be bisected by a prolongation of the graduation line.

6.3.3 *Length of Graduation Lines*

The length of the graduation lines shall be not less than 22 mm and 25 mm for the numbered lines of 500 ml and 1 000 ml beakers, respectively and not less than 12 mm for the unnumbered lines which shall be shorter than the numbered lines.

6.3.4 *Position of Lowest Graduation Line*

The height of the lowest graduation line above the lowest point in the bottom of the measuring space shall be in accordance with Table 4.

6.3.5 *Levelling Lines*

Levelling lines shall be permanently and legibly marked on the opposite side of the measure to, and at the same level as, the 100 ml, 300 ml and 500 ml lines on the 500 ml measure and the 200 ml, 600 ml and 1 000 ml lines on the 1 000 ml measure. The levelling lines shall not be numbered but shall be similar in all other respects to the corresponding graduation lines; the same limits of error of capacity shall apply (*see* Table 5).

6.4 Permissible Errors

For beaker measures presented for checking and stamping to the authorities, the permissible errors shall not exceed ±4 ml for 1 000 ml measure and ±2 ml for 500 ml measure.

Table 4 Dimensions and Graduations for Beaker Measures

(*Clauses* 6.2.2, 6.3.2 *and* 6.3.4)

Nominal Capacity	Diameter at Rim (Excluding Pouring Lip)	Minimum Diameter of Foot	Overall Height	Graduation Lines	Length of Scale	Height of Lowest Graduation Line Above Bottom of Measuring Space	Levelling Lines
ml	mm	mm	mm		mm	mm	
500	100 ± 10	80	180 ± 10	50 ml to 500 ml at each 50 ml, numbered at 50 ml and each 100 ml	100 ± 5	17 ± 5	Unnumbered levelling lines at 100 ml, 300 ml and 500 ml
1 000	120 ± 10	90	230 ± 10	100 ml to 1 000 ml at each 100 ml, numbered at 100 ml and each 200 ml	120 ± 10	20 ± 10	Unnumbered levelling lines at 200 ml, 600 ml and 1 000 ml

Table 5 Limit of Error of Capacity for Beaker Measures

(*Clause* 6.3.5)

Capacity Corresponding to Graduation Line	Limits of Error	
	500 ml measure	1 000 ml measure
ml	ml	ml
50	±2	
100	±2	±4
150	±2	
200	±2	±4
250	±2	
300	±2	±4
350	±2	
400	±2	±4
450	±2	
500	±2	±4
600		±4
700		±4
800		±4
900		±4
1 000		±4

7 MARKING

7.1 Each measure shall have permanently and legibly engraved or etched on its denomination in Indo-Abeic numerals, the abbreviation 'ml' and 'मिली' being used to indicate millilitres. The source of manufacture or trade mark shall be marked on the underside of the base of each measure.

NOTE — The abbreviation 'मिली' may be indicated in the regional script,

ANNEX A

(*Clause* 4.1.2)

TEST FOR ALKALINITY

A-1 APPARATUS

A-1.1 Erlenmeyer Flask

Of resistant glass and of 250 ml capacity.

A-1.2 Mortar

a suitable mortar made of steel.

A-2 REAGENTS

A-2.1 Quality of Reagents

Unless specified otherwise, pure chemicals shall be employed in tests, and distilled water shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2.2 The following reagents are required.

A-2.2.1 *Standard Hydrochloric Acid* — 0·01 N.

A-2.2.2 *Ethyl Alcohol, or Rectified Spirit* (*Conforming to* IS 323 : 1952) — 95 percent by volume.

A-2.2.3 *Standard Sodium Hydroxide Solution* — 0·05 N.

A-2.2.4 *Methyl Red Indicator* — Dissolve 0·04 g of methyl red in 75 ml of ethyl alcohol or rectified spirit. Add 1·5 ml of standard sodium hydroxide solution or a quantity sufficient to ensure that the colour of the solution corresponds to *p*H 5·2 and then dilute to 100 ml with water.

A-2.2.5 *Test Solution*

Add 0·4 ml of standard hydrochloric acid and 0·4 ml of methyl red indicator to 100 ml of water. The colour of the solution should be pink. Boil the solution for some time in Erlenmeyer flask which has been previously tested in accordance with the test under **A-3.1**.

A-3 TESTING OF ERLENMEYER FLASK

A-3.1 Boil the test solution in the Erlenmeyer flask (*see* **A-2.2.5**) and while boiling transfer to the Erlenmeyer flask to be tested. Place the flask quickly in a bath of boiling water so that the level of the contained solution is below the level of the water in the bath. Continue boiling for one hour and at the end of this period observe the colour of the solution. Reject the flask (or the water) if any change in colour of the test solution takes place.

A-3.1.1 Erlenmeyer flasks which have once passed the test for suitability may fail to do so after prolonged storage. In such a case they may be revived by washing with a 5 percent solution of glacial acetic acid followed by washing with water until free from acid.

A-4 PROCEDURE

A-4.1 Crush the two glass measures selected for this test such that the particles pass through IS Sieve 60 but fail to pass through IS Sieve 40. Spread the sieve particles on a glazed paper and pass a magnet over them to remove any particles of iron that may have been introduced during crushing. Weigh accurately 5 g of the sieved glass, clean it free from dust by repeated washing with ethyl alcohol or rectified spirit and dry at 100 ± 2°C. Transfer the clean, dry sieved glass to the Erlenmeyer flask (*see* **A-3.1**) and treat with 100 ml of a fresh portion of the boiling test solution. Place the flask quickly in a bath of boiling water so that the level of the contained solution is below the level of the water in the bath. Continue boiling for 30 minutes. If the solution turns yellow, titrate the solution, without filtering, to the original pink colour by adding standard hydrochloric acid.

A-4.1.1 The measures shall be taken to have satisfied the test if not more than 3 ml of 0·01 N hydrochloric acid is required for the titration.

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Doc : No. LM 06 (0046)

Amendments Issued Since Publicatio

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